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## Formulation of gulabjamun mix by using spray and drum dried skim milk

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### Abstract

From the investigation, it is evident that spray dried skim milk can be effectively used in the formulation of Gulabjamun mix by properly blending it in appropriate proportions with other ingredients like maida, suji, vanaspati and baking power. The data obtained from Organoleptic evaluation showed that the Gulabjamun prepared from formulated Gulabjamun Mix sample in the treatment DT<sub>1</sub> (50:20:10:18:2) was found to be more acceptable in terms of colour & appearance, flavour & taste, body and texture and overall acceptability. ST<sub>1</sub> & DT<sub>1</sub> (50:20:10:18:2) showed maximum value for moisture, protein, total carbohydrate, acidity and ash but lower value for fat. On the basis of microbiological analysis the formulated Gulabjamun Mix sample in treatment ST<sub>1</sub> & DT<sub>1</sub> (50:20:10:18:2) showed satisfactory results for SPC and Yeast & Mould counts. The cost of Gulabjamun mix prepared from spray dried skim milk and drum dried skim milk was estimated to be Rs.138 and Rs.193/kg respectively.

**Keywords:** Spray Dried Skim Milk; Drum Dried Skim Milk; Khoa; Maida; Sugar; Temperature; Colour; Flavour; Hedonic scale.

### 1. Introduction

India has emerged as the largest milk producing country of the World. Nearly 140\ Million metric tons/ year of milk are produced in India. Out of which, 44.5 per cent of milk is used as fluid milk and 55.5 per cent of milk is utilized for sweet making. Various traditional milk products like rasogolla, gulabjamun, sandesh and misti dahi are made in our country since ancient times because of their social, economic, religious, medicinal and cultural significance. Among these, gulabjamun occupies unique place in the array of Indian sweets **Aneja (1992)**. The formulated Gulabjamun mix will meet the consumers' requirement at festivals and other occasions. Consequently many Gulabjamun mixes have been developed in recent years. Most of the Gulabjamun mixes sold in the market are governed by the patent regulation and the general public is not aware of their recipes and compositions. Ghosh *et al.* (1986) have developed the formulation of Gulabjamun mix from roller dried skim milk powder.

### 2. Material and Methods

The experiment "**Process Standardization for Preparation of Gulabjamun Mix by Using Spray and Drum Dried Skim**" was carried out in the Student's Training Dairy and Research Laboratory of Warner School of Food and Dairy Technology, Sam Higginbottom Institute of Agricultural Technology and Sciences (Deemed – to – be – University) Allahabad, U.P.

#### Procurement and collection of ingredient:

Spray dried skim milk powder- It was collected from local market of Allahabad.

Drum dried skim milk powder- It was collected from local market of Allahabad.

Sugar –It was collected from local market of Allahabad.

Maida –It was collected from local market of Allahabad.

Baking powder- It was collected from local market of Allahabad.

#### Treatment combination:

Four different ratios of skim milk powder (spray and drum dried) and two different levels of Maida, Suji and Vanaspati were used for making Gulabjamun mix. Gulabjamun mix prepared from different treatment combinations were compared with each other.

#### Details of treatment combination:

ST<sub>1</sub>–Gulabjamun mix prepared from skim milk powder (spray dried), Maida, Suji, Vanaspati and Baking powder in the ratio (50:20:10:18:

**ST<sub>2</sub>**–Gulabjamun mix prepared from skim milk powder (spray dried), Maida, Suji, Vanaspati and Baking powder in the ratio (50:22:8:18:2).

**ST<sub>3</sub>**–Gulabjamun mix prepared from skim milk powder (spray dried), Maida, Suji, Vanaspati and Baking powder in the ratio (48:20:10:20:2).

**ST<sub>4</sub>**–Gulabjamun mix prepared from skim milk powder (spray dried), Maida, Suji, Vanaspati and Baking powder in the ratio (48:22:8:20:2).

**ST<sub>5</sub>**–Gulabjamun mix prepared from skim milk powder (spray dried), Maida, Suji, Vanaspati and Baking powder in the ratio (46:20:10:22:2).

**ST<sub>6</sub>**–Gulabjamun mix prepared from skim milk powder (spray dried), Maida, Suji, Vanaspati and Baking powder in the ratio (46:22:8:22:2).

**ST<sub>7</sub>**–Gulabjamun mix prepared from skim milk powder (spray dried), Maida, Suji, Vanaspati and Baking powder in the ratio (44:20:10:24:2).

**ST<sub>8</sub>**–Gulabjamun mix prepared from skim milk powder (spray dried), Maida, Suji, Vanaspati and Baking powder in the ratio (44:22:8:24:2).

**DT<sub>1</sub>**–Gulabjamun mix prepared from skim milk powder (Drum dried), Maida, Suji, Vanaspati and Baking powder in the ratio (50:20:10:18:2).

**DT<sub>2</sub>**–Gulabjamun mix prepared from skim milk powder (Drum dried), Maida, Suji, Vanaspati and Baking powder in the ratio (50:22:8:18:2).

**DT<sub>3</sub>**–Gulabjamun mix prepared from skim milk powder (Drum dried), Maida, Suji, Vanaspati and Baking powder in the ratio (48:20:10:20:2).

**DT<sub>4</sub>**–Gulabjamun mix prepared from skim milk powder (Drum dried), Maida, Suji, Vanaspati and Baking powder in the ratio (48:22:8:20:2).

**DT<sub>5</sub>**–Gulabjamun mix prepared from skim milk powder (Drum dried), Maida, Suji, Vanaspati and Baking powder in the ratio (46:20:10:22:2).

**DT<sub>6</sub>**–Gulabjamun mix prepared from skim milk powder (Drum dried), Maida, Suji, Vanaspati and Baking powder in the ratio (46:22:8:22:2).

**DT<sub>7</sub>**–Gulabjamun mix prepared from skim milk powder (Drum dried), Maida, Suji, Vanaspati and Baking powder in the ratio (44:20:10:24:2).

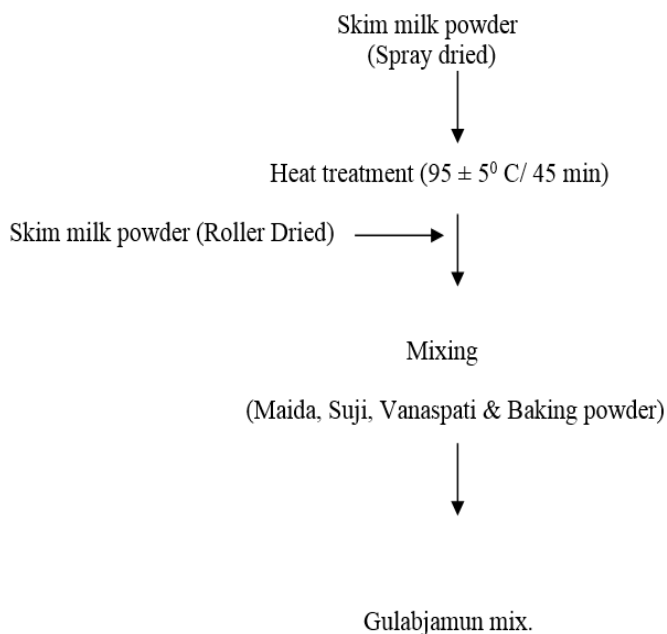
**DT<sub>8</sub>**–Gulabjamun mix prepared from skim milk powder (Drum dried), Maida, Suji, Vanaspati and Baking powder in the ratio (44:22:8:24:2).

### 3. Results and Discussion

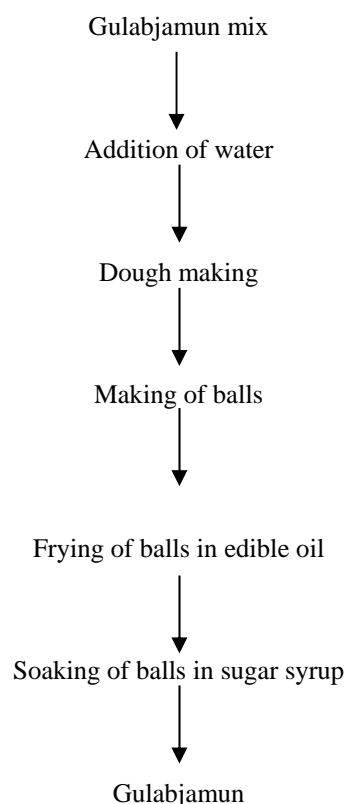
The present study was based to evolve “**Process Standardization for Preparation of Gulabjamun Mix by Using Spray and Drum Dried Skim**”. The data collected on different aspects were tabulated & analyzed statistically using the methods of analysis of variance & critical difference. The significant & non-significant differences observed have been analyzed critically within & between the treatment combinations.

**Average of data obtained on Moisture (%) in experimental Gulabjamun Mix from spray and drum dried skim milk samples:** It can be observed from table no. 1 that the average

Moisture (%) in gulabjamun mix prepared from spray and drum dried skim milk in ST<sub>1</sub>, ST<sub>2</sub>, ST<sub>3</sub>, ST<sub>4</sub>, ST<sub>5</sub>, ST<sub>6</sub>, ST<sub>7</sub>, ST<sub>8</sub>, DT<sub>1</sub>, DT<sub>2</sub>, DT<sub>3</sub>, DT<sub>4</sub>, DT<sub>5</sub>, DT<sub>6</sub>, DT<sub>7</sub> and DT<sub>8</sub> were 8.6, 8.4, 8.08, 7.5, 7.5, 7.46, 7.28, 7.08 ; 8.7, 8.3, 8.08, 8.04, 8.0, 7.6, 7.6 and 7.4 respectively.



**Fig 1:** Preparation of Gulabjamun mix:



**Fig 2:** Production of Gulabjamun from Formulated Gulabjamun mix:

**Table 1:** Average of data obtained on Moisture (%) in experimental Gulabjamun Mix from spray and drum dried skim milk samples:

Treatment	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	R <sub>4</sub>	R <sub>5</sub>	Mean
ST <sub>1</sub>	8.4	8.5	8.6	8.8	8.7	8.60
ST <sub>2</sub>	8.6	8.4	8.2	8.7	8.1	8.40
ST <sub>3</sub>	8.7	8.5	8.2	7.2	7.8	8.08
ST <sub>4</sub>	7.0	7.2	7.5	8.2	6.5	7.50
ST <sub>5</sub>	7.2	7.2	7	6.8	7.2	7.50
ST <sub>6</sub>	7.4	7.8	7.5	7.2	7.6	7.46
ST <sub>7</sub>	7.4	7.7	7.6	7.2	7.6	7.28
ST <sub>8</sub>	7.6	7.8	7.5	7.2	7.2	7.08
DT <sub>1</sub>	8.8	8.5	8.2	9.1	8.9	8.70
DT <sub>2</sub>	8.4	8.2	7.9	8.6	8.4	8.30
DT <sub>3</sub>	7.2	7.4	8.5	8.7	8.6	8.08
DT <sub>4</sub>	8.4	7.6	8.2	8.8	7.2	8.04
DT <sub>5</sub>	8.4	8.6	7.4	8.2	7.4	8.00
DT <sub>6</sub>	7.2	7.6	7.5	7.6	8.2	7.60
DT <sub>7</sub>	7.5	7.9	8	7	6.6	7.60
DT <sub>8</sub>	7.6	7.9	8.2	7.4	6.9	7.40

**Table 2:** ANOVA of data obtained on Moisture in experimental Gulabjamun Mix from spray dried skim milk and drum dried skim milk samples respectively:

Source of Variance	D.F.	SS	MSS	F(cal)	F(tab) at 5%	Result
Replication	4	0.63325	0.15831	0.77918	2.5252151	NS
Powder	1	1.058	1.058	5.20723	4.0011914	S
Treatment	7	15.5055	2.21507	10.9021	2.1665412	S
P X T	7	1.372	0.196	0.96467	2.1665412	NS
Error	60	12.1908	0.20318			
Total	79					

\*NS- Non – Significant

\*\* S- Significant

The above ANOVA table (2) shows that the calculated value of F due to levels of powder is greater than its respective F values at 5 per cent probability levels. Therefore, it can be concluded from the experimental data that there is significant difference between two levels of powder.

**Average of data obtained on Fat (%) in experimental Gulabjamun Mix from spray and drum dried skim milk samples:** It can be observed from table no. 3 that the average fat (%) in gulabjamun mix prepared from spray and drum dried skim milk in ST<sub>1</sub>, ST<sub>2</sub>, ST<sub>3</sub>, ST<sub>4</sub>, ST<sub>5</sub>, ST<sub>6</sub>, ST<sub>7</sub>, ST<sub>8</sub>, DT<sub>1</sub>, DT<sub>2</sub>, DT<sub>3</sub>, DT<sub>4</sub>, DT<sub>5</sub>, DT<sub>6</sub>, DT<sub>7</sub> and DT<sub>8</sub> were 18.5, 18.6, 20.6, 20.7, 22.5, 22.7, 24.6, 24.8; 18.6, 18.8, 20.70, 20.8, 22.6, 22.8, 24.7 and **24.9** respectively.

**Table 3:** Average of data obtained on Fat (%) in experimental Gulabjamun Mix from spray and drum dried skim milk samples:

Treatment	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	R <sub>4</sub>	R <sub>5</sub>	Mean
ST <sub>1</sub>	18.50	18.55	18.45	18.56	18.60	18.5
ST <sub>2</sub>	17.80	18.75	18.85	18.46	18.90	18.6
ST <sub>3</sub>	19.80	19.90	19.87	20.50	20.80	20.6
ST <sub>4</sub>	19.90	19.98	19.87	21.50	21.10	20.7
ST <sub>5</sub>	21.88	22.10	22.30	21.95	22.55	22.5
ST <sub>6</sub>	21.98	22.40	22.50	21.96	22.75	22.7
ST <sub>7</sub>	23.88	23.98	24.12	24.40	23.95	24.6
ST <sub>8</sub>	24.58	24.48	24.14	23.90	23.85	24.8
DT <sub>1</sub>	18.52	18.56	18.48	18.58	18.62	18.6
DT <sub>2</sub>	17.85	18.65	18.75	18.66	18.70	18.8
DT <sub>3</sub>	19.87	19.95	19.97	20.58	20.90	20.70
DT <sub>4</sub>	19.93	19.94	19.97	21.40	21.60	20.8
DT <sub>5</sub>	21.98	22.15	22.20	21.98	22.65	22.6
DT <sub>6</sub>	21.88	22.46	22.60	21.86	22.85	22.8
DT <sub>7</sub>	24.28	23.98	24.42	24.60	23.98	24.7
DT <sub>8</sub>	24.68	24.58	24.44	23.96	23.75	24.9

It can be observed that the fat (%) in gulabjamun mix sample ST<sub>8</sub> and DT<sub>8</sub> was higher than other samples.

**Table 4:** ANOVA for of data obtained on Fat in experimental Gulabjamun Mix from spray dried skim milk and drum dried skim milk samples respectively.

Source of Variance	D.F.	SS	MSS	F(cal)	F(tab) at 5%	Result
Replication	4	9.68767	2.42192	1.88207	2.5252151	NS
Powder	1	31.0628	31.0628	24.1389	4.0011914	S
Treatment	7	39.5077	5.64396	4.38592	2.1665412	S
P X T	7	3.48047	0.49721	0.38638	2.1665412	NS
Error	60	77.2101	1.28684			
Total	79					

\*NS- Non – Significant                      \*\* S- Significant

Data for average fat in gulabjamun mix were statistically analysed to find out significant difference between treatments with regard to the fat in gulabjamun mix samples.

**Average of data obtained on Protein (%) in experimental Gulabjamun Mix from spray and dried skim milk samples:**

It can be observed from table no. 5 that the average protein (%) in gulabjamun mix prepared from spray and drum dried skim milk in ST<sub>1</sub>, ST<sub>2</sub>, ST<sub>3</sub>, ST<sub>4</sub>, ST<sub>5</sub>, ST<sub>6</sub>, ST<sub>7</sub>, ST<sub>8</sub>, DT<sub>1</sub>, DT<sub>2</sub>, DT<sub>3</sub>, DT<sub>4</sub>, DT<sub>5</sub>, DT<sub>6</sub>, DT<sub>7</sub> and DT<sub>8</sub> were 21.41, 21.34, 20.70, 20.83, 19.97, 20.11, 19.25, 19.39; 21.41, 21.34, 20.70, 20.83, 19.97, 20.11, 19.25 and 19.39 respectively.

It can be observed that the per cent protein in gulabjamun mix sample ST<sub>1</sub> and DT<sub>1</sub> was higher than other samples.

Data for average per cent protein in gulabjamun mix were statistically analysed to find out significant difference between treatments with regard to the protein in gulabjamun mix samples.

The above ANOVA table (6) shows that the calculated value of F due to levels of powder is greater than its respective F values at 5 per cent probability levels. Therefore, it can be

concluded from the experimental data that there is significant difference between two levels of powder.

**Table 5:** Average of data obtained on Protein (%) in experimental Gulabjamun Mix from spray and dried skim milk samples:

Treatment	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	R <sub>4</sub>	R <sub>5</sub>	Mean
ST <sub>1</sub>	21.8	20.5	21.6	22.5	21.1	21.41
ST <sub>2</sub>	20.6	21.2	22.5	20.5	21.9	21.34
ST <sub>3</sub>	20.2	19.9	21.1	20.7	21.1	20.70
ST <sub>4</sub>	21.0	20.3	21.5	21.6	20.2	20.83
ST <sub>5</sub>	20.8	19.5	19.6	19.9	19.5	19.97
ST <sub>6</sub>	21.1	20.2	20.5	19.8	20.3	20.11
ST <sub>7</sub>	19.8	18.9	19.6	19.7	19.7	19.25
ST <sub>8</sub>	19.8	19.4	18.5	18.9	19.7	19.39
DT <sub>1</sub>	21.7	20.5	21.6	22.5	21.2	21.41
DT <sub>2</sub>	20.5	21.2	22.5	20.7	21.7	21.34
DT <sub>3</sub>	20.5	19.9	21.2	20.8	21.3	20.70
DT <sub>4</sub>	21.3	20.1	21.5	21.7	20.2	20.83
DT <sub>5</sub>	20.9	19.7	19.6	19.9	19.8	19.97
DT <sub>6</sub>	21.5	20.2	20.5	19.5	20.2	20.11
DT <sub>7</sub>	19.9	18.9	19.5	19.8	19.5	19.25
DT <sub>8</sub>	19.7	19.5	18.5	18.8	19.9	19.39

**Table 6:** ANOVA for of data obtained on Protein in experimental Gulabjamun Mix from spray and drum dried skim milk samples respectively.

Source of Variance	D.F.	SS	MSS	F(cal)	F(tab) at 5%	Result
Replication	4	3.87925	0.96981	1.49444	2.5252151	NS
Powder	1	2.01612	2.01612	3.10677	4.0011914	NS
Treatment	7	94.6129	13.5161	20.8278	2.1665412	S
P X T	7	10.9049	1.55784	2.40057	2.1665412	S
Error	60	38.9368	0.64895			
Total	79					

\*NS- Non – Significant                      \*\* S- Significant

**Average of data obtained on Acidity (%) in experimental Gulabjamun Mix from spray and drum dried skim milk samples:**

It can be observed from table no. 7 that the average protein (%) in gulabjamun mix prepared from spray and drum

dried skim milk in ST<sub>1</sub>, ST<sub>2</sub>, ST<sub>3</sub>, ST<sub>4</sub>, ST<sub>5</sub>, ST<sub>6</sub>, ST<sub>7</sub>, ST<sub>8</sub>, DT<sub>1</sub>, DT<sub>2</sub>, DT<sub>3</sub>, DT<sub>4</sub>, DT<sub>5</sub>, DT<sub>6</sub>, DT<sub>7</sub> and DT<sub>8</sub> were 0.16, 0.16, 0.16, 0.13, 0.13, 0.14, 0.14, 0.12; 0.18, 0.17, 0.15, 0.14, 0.13, 0.13, 0.12 and 0.12 respectively.

**Table 7:** Average of data obtained on Acidity (%) in experimental Gulabjamun Mix from spray and drum dried skim milk samples:

Treatment	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	R <sub>4</sub>	R <sub>5</sub>	Mean
ST <sub>1</sub>	0.15	0.16	0.15	0.16	0.18	0.16
ST <sub>2</sub>	0.14	0.18	0.17	0.19	0.12	0.16
ST <sub>3</sub>	0.16	0.15	0.15	0.17	0.18	0.16
ST <sub>4</sub>	0.13	0.12	0.14	0.12	0.13	0.13
ST <sub>5</sub>	0.12	0.13	0.14	0.11	0.12	0.13
ST <sub>6</sub>	0.13	0.15	0.14	0.15	0.15	0.14
ST <sub>7</sub>	0.15	0.14	0.16	0.15	0.12	0.14
ST <sub>8</sub>	0.16	0.15	0.15	0.17	0.18	0.12
DT <sub>1</sub>	0.17	0.18	0.17	0.19	0.18	0.18
DT <sub>2</sub>	0.18	0.13	0.16	0.19	0.19	0.17
DT <sub>3</sub>	0.15	0.18	0.16	0.19	0.12	0.15
DT <sub>4</sub>	0.13	0.17	0.12	0.15	0.18	0.14
DT <sub>5</sub>	0.11	0.12	0.12	0.15	0.14	0.13
DT <sub>6</sub>	0.12	0.14	0.11	0.15	0.12	0.13
DT <sub>7</sub>	0.15	0.16	0.15	0.14	0.15	0.12
DT <sub>8</sub>	0.17	0.16	0.15	0.17	0.15	0.12



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